

# Synergistic satellite and ground-based observations for evaluating aerosol plume transport and impact on air quality in NYC area

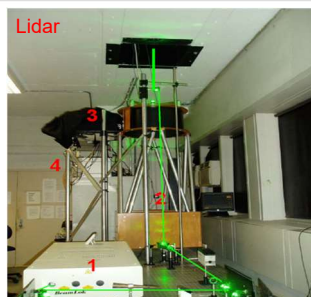
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## Abstract

This study presents a synergistic observation of aloft aerosol plumes and their transport by the satellite and ground-based sensors in New York City. Two episodes of the wildfire smoke originated from Canada are presented. Time-height distribution and optical properties of the aerosol plumes are characterized from a ground-based lidar. The sources, transport paths and the potential influences on air quality (e.g. ground  $PM_{2.5}$ ) are investigated from the satellites (GOES-east, VIIRS and MODIS) and ground-based observations. Based on the multi-year lidar observations, we show the season-height occurrence and the aloft-aerosol-layer AOD, and evaluate their influence on the relationship of satellite-derived AOD and ground  $PM_{2.5}$ .

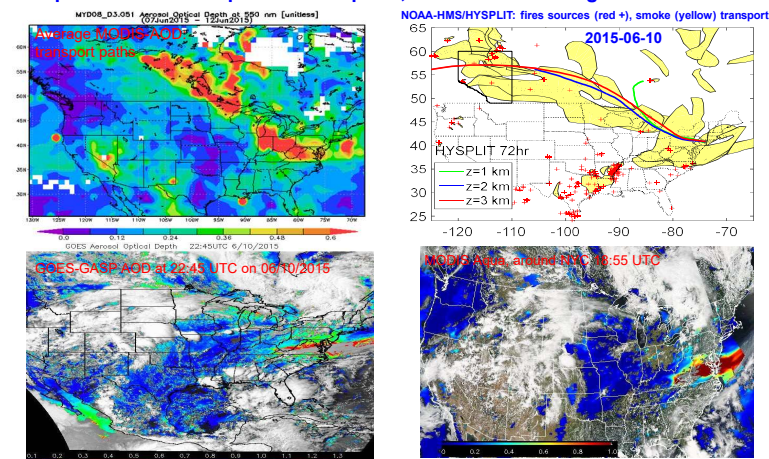
## CCNY-lidar and co-located ground-based instruments

- 1. A three-wavelength Elastic-Raman Lidar:** 2-3 day/week, daytime (10~17:00 LT)
  - ✦ 1064-, 532-, 355-, 387- and 407-nm (3-elastic & 2-Raman ch. from  $N_2$  &  $H_2O$ );
  - ✦ Profiling aerosol extinction, backscatter and Angstrom exp., lidar-ratio; PBLH &  $H_2O$ (night)
- 2. A Ceilometer (Vaisala-51 & 31):** 24-hr/7-day automatic run.
  - ✦ PBLH, near surface aerosols and cloud height up to 7.5 km altitude.
- 3. A CIMEL sunphotometer (SP)** (AERONET-CCNY and LISCO sites)
  - ✦ AOD at 340~1020 nm, Angstrom exponent, water vapor content;
  - ✦ Inversion data (volume size distribution, refractive index, SSA).
- 4. Air quality monitoring station (NYSDEC):** surface  $PM_{2.5}$ ,  $O_3$ , CO.
5. Microwave radiometer (MWR-3000a , T, RH, liquid water)

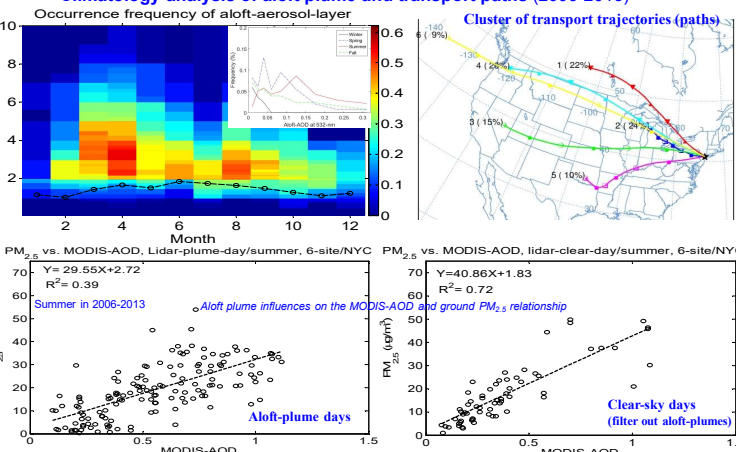
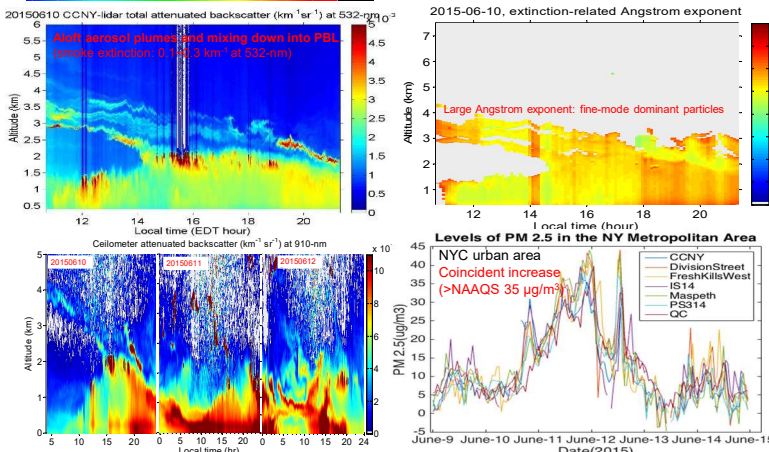
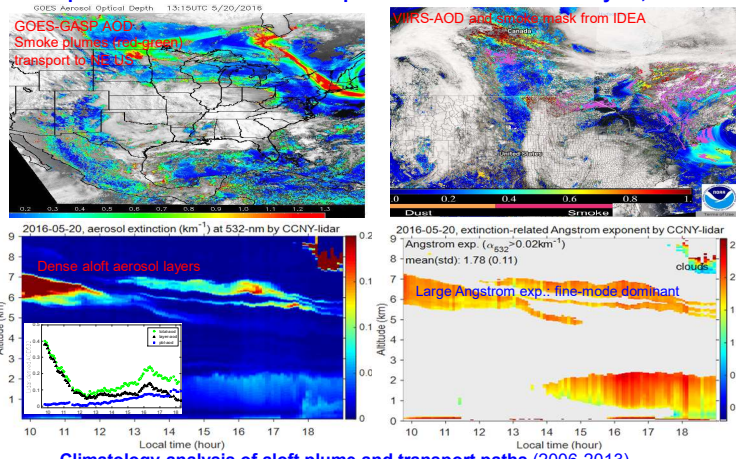


## Smoke plumes transport and impacts on air quality

### Episode-1: Aerosol plumes transports, sources and mixing down into PBL



### Episode-2: Aloft dense smoke plumes from Canada on May 20, 2016



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